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A-Z of nutritional supplements: dietary supplements, sports nutrition foods and ergogenic aids for health and performance **Part 31**

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INTRODUCTORY REMARKS

This issue deals with the increasingly interesting topic of probiotics and also, slightly out of alphabetical order, with pycnogenol, a product usually associated with pine bark. Probiotics are food supplements containing live microorganisms. They modify intestinal microbiota in a way that enables beneficial bacteria to increase. An additional benefit is that probiotics in sufficient quantities also tend to decrease those species of bacteria which are considered harmful. It is suggested that this situation produces many potential benefits for the health and functioning of the digestive system, and also has a beneficial effect on immune function. In the short review below, the effects of probiotics and their efficacy in reducing infection incidence (or symptom severity/duration) in athletes are summarised. Pycnogenol supplementation has previously been considered to have a range of beneficial effects, including anti-oxidant and anti-inflammatory properties.

Probiotics

M Gleeson

Probiotics are food supplements that contain live microorganisms which when administered in adequate amounts can confer a health benefit on the host.¹ There is now a reasonable body of evidence

that regular consumption of probiotics strains that are proven to survive gut transit can modify the population of the gut dwelling bacteria (microbiota) and influence immune function²⁻⁵ though it should be noted that such effects are dose and strain dependent. Probiotics modify the intestinal microbiota such that the numbers of beneficial bacteria increase and usually numbers of species considered harmful are decreased. Such changes have been associated with a range of potential benefits to the health and functioning of the digestive system, as well as modulation of immune function.

Probiotics have several mechanisms of action. By their growth and metabolism, they help inhibit the growth and reduce potentially harmful effects of other bacteria, antigens, toxins and carcinogens in the gut. In addition, probiotics are known to interact with the gut-associated lymphoid tissue, leading to positive effects on the innate and even the acquired immune system.

Studies have shown that probiotic intake can improve rates of recovery from rotavirus diarrhoea, increase resistance to enteric pathogens, and promote anti-tumour activity.²⁻⁴ Some evidence suggests that probiotics may be effective in alleviating some allergic and respiratory disorders in young children.^{6,7} In recent years it has become evident that some probiotics, particularly *Lactobacillus* (*L.*) strains, when ingested on a daily basis, can reduce upper respiratory tract infection (URTI) incidence in adults.⁸⁻¹²

Probiotic intervention studies in athletes

Although there are few published studies of the effectiveness of probiotic use in athletes, there is growing interest in examining their potential to help to maintain overall general health, enhance immune function or reduce URTI incidence and symptom severity/duration.^{13,14}

A *L. rhamnosus* GG supplement was investigated in 141 marathon runners who were recruited for a randomized, double-blind intervention study in which they received probiotic or placebo daily for a 3-month training period and then participated in a marathon race with a 2-week follow-up of illness symptoms.¹⁵ Although there were no differences in the number of URTI or gastrointestinal symptom episodes, the duration of gastrointestinal symptom episodes in the probiotic group was shorter than in the placebo group during the training period (2.9 versus 4.3 days) and during the 2 weeks after the marathon (1.0 versus 2.3 days). In a double-blind, placebo-controlled, cross-over trial in which healthy

elite distance runners received the probiotic *L. fermentum* or placebo daily for 28 days with a 28-day washout period between the initial and the second treatment, athletes (n=20) suffered fewer days of respiratory illness and lower severity of respiratory illness symptoms when taking the daily probiotic.¹⁶ The probiotic treatment also elicited a two-fold greater change in whole-blood culture interferon (IFN)- γ production compared with placebo, which may be one mechanism underpinning the positive clinical outcomes. In another study of athletes who presented with fatigue, impaired performance and a deficit in blood CD4+ (T-helper) cell IFN- γ production compared with healthy control athletes, this apparent T cell impairment was reversed following a one-month course of daily probiotic (*L. acidophilus*) ingestion.¹⁷

In a study on the effect of a *L. casei* probiotic supplement on URTI and immune and hormonal changes in soldiers participating in 3 weeks of commando training followed by a 5-day combat course, no difference in infection incidence between groups receiving daily probiotic or placebo was reported.¹⁸ Among the immune parameters investigated, the major finding was a significant decrease in salivary immunoglobulin A (IgA) concentration after the combat course in the placebo group, with no change over time in the probiotic group. A recent randomised, placebo controlled trial in 64 university athletes reported a lower incidence of URTI episodes during a 4-month winter training period in subjects receiving daily probiotic (*L. casei* Shirota) compared with placebo and this study also reported better maintenance of salivary IgA in the probiotic group.¹⁹ Importantly, in both athlete and non-athlete populations, falls in saliva IgA have been associated with increased URTI incidence.²⁰ Another recent study using *L. fermentum* reported reduced URTI incidence among male but not female athletes during 11 weeks of training.²¹

Conclusions

From the research reviewed here, one cannot reach a solid conclusion of probiotic benefit for sports people. Nevertheless, there is now sufficient understanding of the mechanism of action of certain probiotic strains, and enough evidence from trials with highly physically active people to signify that this is a promising area of research with mostly positive indications at present. To date most studies of probiotic interventions in athletes have been relatively small scale; subsequently some large scale, double-blind, placebo-controlled trials are needed to confirm likely probiotic benefits for athletes.

Pycnogenol

J Siegler

Pycnogenol (also referred to commonly as picnogel or pycnogel) is a combination of active bioflavonoids produced from the bark of the *Pinus maritime* pine tree. Pycnogenol supplementation has been reported to have a wide array of health benefits, including improved cognitive function, endothelial function, blood pressure regulation and venous insufficiency. Pycnogenol also may act as an anti-inflammatory agent.^{1,2} In most instances, reference is made to pycnogenol as a powerful antioxidant due to the proportionally high levels of procyanidins within the compound.³

Recommended doses of pycnogenol range widely and depend upon the treatment aim. For example, to combat chronic venous insufficiency recommended doses range from 150-360 mg/day, whereas others have recommended approximately 75-90 mg/day to prevent oxidative tissue damage.^{2,4} In a majority of clinical trials, the duration of supplementation is generally 2-3 months. Side effects of pycnogenol supplementation are minimal. There is at least one commercial sports supplement based on pycnogenol which claims to enhance performance and fatigue resistance, and preliminary evidence of such benefits requires further substantiation²⁶. One problem of such supplements, however, is the lack of information on the dosage of claimed active ingredients.

CONCLUDING COMMENTS

Supplementation with probiotics seems to be a promising area for future research. However, as yet there is insufficient evidence to recommend this supplement unreservedly for use by athletes. A wide range of conditions and outcomes using probiotic supplementation has been studied, sometimes in rather small scale trials. Further research is needed in this area, and it is important that this should focus upon large scale, double-blind, placebo-controlled trials.

Pycnogenol has been reported to have some favourable effects in several clinical studies, using a wide range of doses, with little evidence of side effects. However, claims and preliminary evidence of its benefits to sports performance require further study.

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Conflicts of Interest None declared

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